

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents
United States Patent and Trademark
Office
Box PCT
Washington, D.C.20231
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 18 July 2000 (18.07.00)	
International application No. PCT/FI99/00969	Applicant's or agent's file reference 49170
International filing date (day/month/year) 24 November 1999 (24.11.99)	Priority date (day/month/year) 25 November 1998 (25.11.98)
Applicant RAJANIEMI, Jaakko	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
12 June 2000 (12.06.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

<p>The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p>	<p>Authorized officer</p> <p>Nestor Santesso</p> <p>Telephone No.: (41-22) 338.83.38</p>
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20 October 2000

European Patent Office

D-80298 Munich
 Germany

Via facsimile: (8 pages)
 999-49-89-2399-4465

CONFIRMATION BY MAIL!

Our Ref.: 49170/ML/MB/MM

**REPLY TO WRITTEN OPINION
 INTERNATIONAL PATENT APPLICATION NO. PCT/FI99/00969
 APPLICANT: NOKIA NETWORKS OY**

In response to the Written Opinion dated 20 July 2000 we submit the following.

The applicant would like first to direct the attention of the Examiner to the difference between the present invention and D1 regarding the concept of "location". In the present invention the applicant has adopted the language that has been used in the field of cellular radio networks for a long time, where the "location" of a mobile station means its abstract, administrative location within the hierarchical structure of a cellular network. A network of this kind consists of a very large number of cells, each cell being centered around a base station. The concept of Location Area may cover even a single cell, although it is more common that a Location Area consists of a small number of closely neighbouring or even overlapping cells.

The importance of the Location Area concept is mostly related to the situation where the network must route a paging request (a request for setting up a call) to a certain mobile station. The mobile stations are mobile by definition, so the network can never know exactly, where a mobile station currently is, i.e. in which cell(s) should a paging request be transmitted over the radio interface. However, it would waste enormous amounts of transmission capacity to transmit each and every paging request in each and every cell of the network just to hear the mobile station's answer from one of the cells. Therefore the mobile stations regularly transmit short signalling messages known as Location Update messages, by the help of which the network is able to keep track on the location of each mobile station *with the resolution of a Location Area*. The paging requests are then only transmitted through the base stations of that Location Area where the mobile station is known to sojourn. A mobile station transmits a Location Update message at least every time when it moves over to a new cell, or at least when it moves into a cell that belongs to a different Location Area then its previous serving cell.

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Berggren Oy Ab

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The traditional cellular radio network was not interested in the exact physical or geographical location of the mobile station, as long as it knew that the mobile station was "administratively" within a certain Location Area. Theoretically it would be possible to define the Location Areas to consist of even a number of cells that are geographically very distant from each other (like on different continents), in which case the knowledge that a mobile station currently resides within a certain Location Area would give little or no hints about its geographical location; for the above-explained purpose of routing the paging messages that arrangement would serve exactly as well as it does in its present, practically more feasible form.

An extension of this administrative location concept is the administrative location of the mobile station with the resolution of a single cell. Even if we adhere to the above-explained wider principle of having the Location Area comprise several cells, the cell-wise aspect of location comes into question when we think about macrodiversity, where a mobile station may simultaneously communicate with a number of cells. It is perfectly possible and even probable that all cells that the mobile station is communicating with do not belong to the same Location Area. How should it then be determined, whether the mobile station should transmit a Location Update message or not? This is the field of problems where the present invention comes into play: the aim of the invention is to determine, which one of the number of simultaneously serving cells represents the "actual" administrative location of the mobile station that determines for example the eventual need for transmitting Location Update messages.

On the other hand, the development of mobile communication has brought up a situation where it is regarded as desirable to utilize a mobile station and its communicational capabilities with the network even for enabling the determination of the exact physical location of the mobile station. D1 is an example of a solution where this meaning of the word "location" is discussed: see for example lines 14-31 on page 1 of D1. The concept of exact physical location may become important for example in a situation where an emergency exchange receives an emergency call from a mobile station the user of which is unable to give himself his exact physical location. The determination of an actual, exact physical location involves completely other kind of problems than those that are encountered in the field of keeping track of administrative locations. It is the opinion of the applicant that it would be extremely unfair to use the mere coincidence of words as means for denying patentability of his invention, when the concepts that lie behind the words are so widely different from each other.

However, the applicant is ready to admit that he has himself given a large amount of reason for taking up reference publications like D1, because the concept of "location" was not adequately defined in the original form of the independent claims. Several amendments are now made to the claims in order to remedy this deficiency.

Firstly, the concept "location control" in claim 1 is replaced with "location management", which as an expression is both in line with the title of the application and a more adequate condensed description of the process of keeping track of administrative locations instead of determining exact physical locations.

Secondly, the second characteristic feature of claim 1 was changed to read: " at least partly based on the priority levels, determining a cell to be used as the location of the mobile station". Simultaneously also the first feature in claim 1 was editorially changed into the "-ing" form of a method step.

In claim 20 the feature that the mobile station comprises receiving means is moved to the preamble. The characterising portion of claim 20 is brought into conformity with the amended form of claim 1, so that it is a certain feature of the receiving means that belongs to the category of characteristic features of the invention and the task of the selecting means is recast into a wording that conforms to that used in claim 1.

The definition "for location management" is added into claim 22 to put it already from the beginning more into line with the other independent claims. Additionally there is added into claim 22 the feature of transmitting to the mobile stations information for construction of a priority order for the plurality of cells with the mobile stations communicate in a macro diversity connection. Also the second characteristic feature of claim 22 is amended to associate the information specifying a master cell and its indication to a core network of the cellular telecommunication system to the priority information exchanged with the mobile station.

The Examiner requires D1 to be mentioned in the description and the features thereof to be referred to in the preamble of the independent claims, but the applicant respectfully disagrees. Based on the above-given reasoning about the difference between administrative location management as in the invention and geographical location determination, the applicant finds it impossible to regard D1 as the closest prior art. Even the concept of priority levels to cells, referred to by the Examiner as appearing on page 11, lines 21-26 etc. is, according to the applicant, not disclosed in D1 in such a sense that it would enhance the pertinence of D1 in any way.

Positive reconsideration of the merits of the application is respectfully requested.

BERGGREN OY AB



Pekka Tanhua
Patent Attorney

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible.

Claims

1. A method for location management in a cellular telecommunication system supporting macro diversity connections, **characterised** in that, regarding a macro
5 diversity situation it comprises the steps of:
 - assigning priority levels to the cells of an active set of a macro diversity connection, and
 - at least partly based on the priority levels, determining a cell to be used as the location of the mobile station.
- 10 2. A method according to claim 1, **characterised** in that each of the cells used in a macro diversity connection between a mobile station and the network is classified as being in a serving cell set or outside said serving cell set.
- 15 3. A method according to claim 2, **characterised** in that one of the cells in the serving cell set is selected to be a master cell.
4. A method according to claim 3, **characterised** in that said selection is performed by the network.
- 20 5. A method according to claim 4, **characterised** in that the network performs the selection of the master cell as a response to a message received from the mobile station, which message does not contain an indication of a master cell.
- 25 6. A method according to claim 3, **characterised** in that said selection is performed according to a predefined rule.
7. A method according to claim 6, **characterised** in that
30 the cell of the serving cell set which has been in the active set for the longest time is selected to be the master cell.
8. A method according to claim 3, **characterised** in that said selection is performed by the mobile station.
- 35 9. A method according to claim 8, **characterised** in that the cell selected by the mobile station is indicated to the network in a message sent by the mobile station.

10. A method according to claim 8, **characterised** in that

- the mobile station requests location information from the network,
- the mobile station receives a response to the request from the network, and
- 5 - the selection of the master cell is performed at least partly based on said response.

11. A method according to claim 8, **characterised** in that

said selection is performed at least partly on the basis of information about localised services of the network stored in the mobile station.

10

12. A method according to claim 1, **characterised** in that

the priority levels of the cells in the active set are changed as a response to serving RNC relocation.

15 13. A method according to claim 2, **characterised** in that

as a response to serving RNC relocation, the cells of the active set which were designated as being in the serving cell set are designated as being outside the serving cell set, and the cells of the active set which were designated as being outside the serving cell set are designated as being in the serving cell set.

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14. A method according to claim 2, **characterised** in that

the mobile station designates those cells of the active set as being in the serving cell set, which cells are listed in a message received from the network informing the mobile station about a serving RNC relocation, and designates other cells of the active set as being outside the serving cell set.

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15. A method according to claim 2 used in a cellular telecommunication system comprising a first network element for controlling circuit switched connections and a second network element for controlling packet switched connections, **characterised** in that

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when a mobile station has an active connection to a first of the first and second network elements and no active connections to a second of the first and second network elements,

a location update to said second of the first and second network elements is performed at least partly as a response to a change in said serving cell set.

35

16. A method according to claim 15, **characterised** in that

said location update is performed at least partly as a response to the changing of all cells in the serving cell set.

17. A method according to claim 15, **characterised** in that

- 5 said location updates are performed at least partly as a response to removing of the last of those cells in the serving cell set, which cells were in the serving cell set when a location update was performed the previous time.

18. A method according to claim 15, **characterised** in that

10 the method comprises steps, in which

- the mobile station requests location information from the network,
 - the mobile station receives a response to the request from the network, and
 - the mobile station makes a decision about whether or not to perform a location update to said second of the first and second network elements at least partly based
- 15 on said response.

19. A method according to claim 2 used in a cellular telecommunication system comprising a first network element for controlling circuit switched connections and a second network element for controlling packet switched connections,

20 **characterised** in that

when a mobile station has an active connection to a first of the first and second network elements and no active connections to a second of the first and second network elements, a location update to said first of the first and second network elements is performed at least partly as a response to a change in said serving cell set.

25

20. A mobile station for a cellular telecommunication system comprising a cellular network, which mobile station has means for communicating using macro diversity connections in which the mobile station communicates with the cellular network via a plurality of cells, said means for communicating comprising receiving means,

30 **characterised** in that

- the receiving means are arranged to receive information for construction of a priority order for the plurality of cells with which the mobile station communicates in a macro diversity connection, and
- 35 - the mobile station comprises selecting means that are arranged to select a master cell to be used as the location of the mobile station at least partly on the basis of said priority order.

21. A mobile station according to claim 20, **characterised** in that the mobile station further comprises means for indicating the selected master cell to the network.

5 22. A system for location management in a cellular telecommunication system, **characterised** in that

- the system is arranged to transmit to a mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection, and

10 - the system is arranged to receive from a mobile station, after having transmitted to said mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection, information specifying a master cell and to indicate the specified cell as the location of the mobile station to a core network of the cellular
15 telecommunication system.

23. A system according to claim 22, **characterised** in that the system is located in a radio access network of the cellular telecommunication system.

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24. A system according to claim 23, **characterised** in that the system is located in the radio network controller of said radio access network.

PATENT COOPERATION TREATY

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INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 49170	<div style="display: flex; justify-content: space-between;"> <div style="text-align: center;">FOR FURTHER ACTION</div> <div style="font-size: small;">see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.</div> </div>	
International application No. PCT/FI 99/00969	International filing date (<i>day/month/year</i>) 24 November 1999	(Earliest) Priority Date (<i>day month/year</i>) 25 November 1998
Applicant Nokia Networks OY et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 2 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. ☐ Certain claims were found unsearchable (See Box I).

2. ☐ Unity of invention is lacking (See Box II).

3. ☐ The international application contains disclosure of a **nucleotide and/or amino acid sequence listing** and the international search was carried out on the basis of the sequence listing

☐ filed with the international application.
☐ furnished by the applicant separately from the international application,

☐ but not accompanied by a statement to the effect that it did not include matter going beyond the disclosure in the international application as filed.

☐ transcribed by this Authority.

4. With regard to the title, ☒ the text is approved as submitted by the applicant.
☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☒ the text is approved as submitted by the applicant.
☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is:

Figure No. 2

☒ as suggested by the applicant.
☐ because the applicant failed to suggest a figure.
☐ because this figure better characterizes the invention.

☐ None of the figures.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00969

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9608119 A2 (TELIA AB), 14 March 1996 (14.03.96), page 3, line 10 - page 5, line 24 --	1-24
A	WO 9825427 A1 (NOKIA TELECOMMUNICATIONS OY), 11 June 1998 (11.06.98), page 1, line 30 - page 3, line 33 --	1-24
P, A	WO 9931819 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 24 June 1999 (24.06.99), abstract -- -----	1-24

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"F" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

27 April 2000

Date of mailing of the international search report

07.06.2000

Name and mailing address of the International Searching Authority
European Patent Office P.B. 5818 Patentlaan 2
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Authorized officer

Stefan Hansson/cs
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SA 259258

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/FI 99/00969

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9608119	A2	14/03/96	EP	0777951 A	11/06/97
				SE	505006 C	09/06/97
				SE	9402886 A	01/03/96
WO	9825427	A1	11/06/98	AU	5190398 A	29/06/98
				EP	0945038 A	29/09/99
				FI	964855 A	05/06/98
				NO	992693 A	03/06/99
WO	9931819	A1	24/06/99	AU	1795599 A	05/07/99

The demand must be filed directly with the competent International Preliminary Examining Authority or, if two or more Authorities are competent, with the one chosen by the applicant. The full or two-letter code of that Authority may be indicated by the applicant on the line below:

IPEA/EPO

PCT

CHAPTER II

DEMAND

under Article 31 of the Patent Cooperation Treaty:

The undersigned requests that the international application specified below be the subject of international preliminary examination according to the Patent Cooperation Treaty and hereby elects all eligible States (except where otherwise indicated).

For International Preliminary Examining Authority use only

Identification of IPEA		Date of receipt of DEMAND
Box No. I IDENTIFICATION OF THE INTERNATIONAL APPLICATION		Applicant's or agent's file reference 49170
International application No. PCT/FI99/00969	International filing date (day/month/year) 24 November 1999 (24.11.99)	(Earliest) Priority date (day/month/year) 25 November 1998 (25.11.98)
Title of invention LOCATION MANAGEMENT METHOD		
Box No. II APPLICANT(S)		
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) NOKIA NETWORKS OY P.O.Box 300 FIN-00045 Nokia Group Finland		Telephone No.:
		Facsimile No.:
		Teleprinter No.:
State (that is, country) of nationality: Finland	State (that is, country) of residence: Finland	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) RAJANIEMI, Jaakko Lapinrinne 2 A 11 FIN-00180 Helsinki Finland		
State (that is, country) of nationality: Finland	State (that is, country) of residence: Finland	
Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.) 		
State (that is, country) of nationality:	State (that is, country) of residence:	
<input type="checkbox"/> Further applicants are indicated on a continuation sheet.		

Box No. III AGENT OR COMMON REPRESENTATIVE: OR ADDRESS FOR CORRESPONDENCEThe following person is ☒ agent ☐ common representativeand ☒ has been appointed earlier and represents the applicant(s) also for international preliminary examination.☐ is hereby appointed and any earlier appointment of (an) agent(s)/common representative is hereby revoked.☐ is hereby appointed, specifically for the procedure before the International Preliminary Examining Authority, in addition to the agent(s)/common representative appointed earlier.Name and address: *(Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)*BERGGREN OY AB
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☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.**Box No. IV BASIS FOR INTERNATIONAL PRELIMINARY EXAMINATION****Statement concerning amendments:***

1. The applicant wishes the international preliminary examination to start on the basis of:

☐ the international application as originally filedthe description ☐ as originally filed☐ as amended under Article 34the claims ☐ as originally filed☐ as amended under Article 19 (together with any accompanying statement)☐ as amended under Article 34the drawings ☐ as originally filed☐ as amended under Article 342. ☐ The applicant wishes any amendment to the claims under Article 19 to be considered as reversed.3. ☐ The applicant wishes the start of the international preliminary examination to be postponed until the expiration of 20 months from the priority date unless the International Preliminary Examining Authority receives a copy of any amendments made under Article 19 or a notice from the applicant that he does not wish to make such amendments (Rule 69.1(d)). *(This check-box may be marked only where the time limit under Article 19 has not yet expired.)*

* Where no check-box is marked, international preliminary examination will start on the basis of the international application as originally filed or, where a copy of amendments to the claims under Article 19 and/or amendments of the international application under Article 34 are received by the International Preliminary Examining Authority before it has begun to draw up a written opinion or the international preliminary examination report, as so amended.

Language for the purposes of international preliminary examination: English☒ which is the language in which the international application was filed.☒ which is the language of a translation furnished for the purposes of international search.☒ which is the language of publication of the international application.☐ which is the language of the translation (to be) furnished for the purposes of international preliminary examination.**Box No. V ELECTION OF STATES**The applicant hereby elects all eligible States *(that is, all States which have been designated and which are bound by Chapter II of the PCT)*

excluding the following States which the applicant wishes not to elect:

Box No. VI CHECK LIST

The demand is accompanied by the following elements, in the language referred to in Box No. IV, for the purposes of international preliminary examination:

- | | | |
|--|---|--------|
| 1. translation of international application | : | sheets |
| 2. amendments under Article 34 | : | sheets |
| 3. copy (or, where required, translation) of amendments under Article 19 | : | sheets |
| 4. copy (or, where required, translation) of statement under Article 19 | : | sheets |
| 5. letter | : | sheets |
| 6. other (<i>specify</i>) | : | sheets |

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Examining Authority use only

received not received

<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>

The demand is also accompanied by the item(s) marked below:

- | | |
|--|---|
| 1. <input checked="" type="checkbox"/> fee calculation sheet | 4. <input type="checkbox"/> statement explaining lack of signature |
| 2. <input type="checkbox"/> separate signed power of attorney | 5. <input type="checkbox"/> nucleotide and or amino acid sequence listing in computer readable form |
| 3. <input type="checkbox"/> copy of general power of attorney; reference number, if any: | 6. <input type="checkbox"/> other (<i>specify</i>): |

Box No. VII SIGNATURE OF APPLICANT, AGENT OR COMMON REPRESENTATIVE

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the demand).

BERGGREN OY AB



Markus Levlin
Patent Agent

12 June 2000

For International Preliminary Examining Authority use only

1. Date of actual receipt of DEMAND:

2. Adjusted date of receipt of demand due to CORRECTIONS under Rule 60.1(b):

- | | |
|--|---|
| 3. <input type="checkbox"/> The date of receipt of the demand is AFTER the expiration of 19 months from the priority date and item 4, or 5, below, does not apply. | <input type="checkbox"/> The applicant has been informed accordingly. |
| 4. <input type="checkbox"/> The date of receipt of the demand is WITHIN the period of 19 months from the priority date as extended by virtue of Rule 80.5. | |
| 5. <input type="checkbox"/> Although the date of receipt of the demand is after the expiration of 19 months from the priority date, the delay in arrival is EXCUSED pursuant to Rule 82. | |

For International Bureau use only

Demand received from IPEA on:

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF RECEIPT OF
RECORD COPY

(PCT Rule 24.2(a))

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE*Berggren Oy Ab*

25 -01- 2000

Date of mailing (day/month/year) 12 January 2000 (12.01.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 49170	International application No. PCT/FI99/00969

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

NOKIA NETWORKS OY (for all designated States except US)

RAJANIEMI, Jaakko (for US)

International filing date : 24 November 1999 (24.11.99)

Priority date(s) claimed : 25 November 1998 (25.11.98)

Date of receipt of the record copy
by the International Bureau : 23 December 1999 (23.12.99)

List of designated Offices :

AP : GH,GM,KE,LS,MW,SD,SL,SZ,TZ,UG,ZW

EA : AM,AZ,BY,KG,KZ,MD,RU,TJ,TM

EP : AT,BE,CH,CY,DE,DK,ES,FI,FR,GB,GR,IE,IT,LU,MC,NL,PT,SE

OA : BF,BJ,CF,CG,CI,CM,GA,GN,GW,ML,MR,NE,SN,TD,TG

National : AE,AL,AM,AT,AU,AZ,BA,BB,BG,BR,BY,CA,CH,CN,CR,CU,CZ,DE,DK,DM,EE,ES,FI,GB,

GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KP,KR,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,

MW,MX,NO,NZ,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,US,UZ,VN,YU,ZA,ZW

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase
- ☒ confirmation of precautionary designations
- ☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer:

Marie-José Devillard

Telephone No. (41-22) 338.83.38

PCT COOPERATION TREATY

Berggren Oy Ab

13-03-2000

MM/11

PCT

*mappein!*NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Date of mailing (day/month/year) 01 March 2000 (01.03.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 49170	
International application No. PCT/FI99/00969	International filing date (day/month/year) 24 November 1999 (24.11.99)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 25 November 1998 (25.11.98)
Applicant NOKIA NETWORKS OY et al	

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
25 Nove 1998 (25.11.98)	982556	FI	22 Febr 2000 (22.02.00)

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer Carlos Naranjo Telephone No. (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Berggren Oy Ab

12 -06- 2000

mm/mc

Date of mailing (day/month/year) 02 June 2000 (02.06.00)		IMPORTANT NOTICE	
Applicant's or agent's file reference 49170			
International application No. PCT/FI99/00969	International filing date (day/month/year) 24 November 1999 (24.11.99)	Priority date (day/month/year) 25 November 1998 (25.11.98)	
Applicant NOKIA NETWORKS OY et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,CN,JP,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,CA,CH,CR,CU,CZ,DE,DK,DM,EA,EE,EP,ES,FI,GB,GD,GE, GH,GM,HR,HU,ID,IL,IN,IS,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MD,MG,MK,MN,MW,MX,NO,NZ,OA, PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU,ZA,ZW
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 02 June 2000 (02.06.00) under No. WO 00/31988

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

From the:
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:

BERGGREN OY AB
P.O.Box 16
00101 Helsinki
FINLANDE

Berggren Oy Ab

25-07-2000
MM/ML

PCT

WRITTEN OPINION

(PCT Rule 66)

Date of mailing (day/month/year) 20.07.2000	
Applicant's or agent's file reference 49170	
REPLY DUE within 3 month(s) from the above date of mailing	
International application No. PCT/FI99/00969	International filing date (day/month/year) 24/11/1999
Priority date (day/month/year) 25/11/1998	
International Patent Classification (IPC) or both national classification and IPC H04Q7/00	
Applicant NOKIA NETWORKS OY et al.	

1. This written opinion is the first drawn up by this International Preliminary Examining Authority.
2. This opinion contains indications relating to the following items:
 - I ☒ Basis of the opinion
 - II ☐ Priority
 - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
 - IV ☐ Lack of unity of invention
 - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
 - VI ☐ Certain document cited
 - VII ☒ Certain defects in the international application
 - VIII ☒ Certain observations on the international application
3. The applicant is hereby **invited to reply** to this opinion.

When? See the time limit indicated above. The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also: For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.
4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: 25/03/2001.

Name and mailing address of the international preliminary examining authority:

 European Patent Office
D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
Fax: +49 89 2399 - 4465

Authorized officer / Examiner

Banerjea, R

Formalities officer (incl. extension of time limits)

Finnie, A

Telephone No. +49 39 2399 8251



I. Basis of the opinion

1. This opinion has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed")*:

Description, pages:

1-15 as originally filed

Claims, No.:

1-24 as originally filed

Drawings, sheets:

1/3-3/3 as originally filed

2. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. This opinion has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. Statement**

Novelty (N)	Claims	1, 20, 22
Inventive step (IS)	Claims	1-24
Industrial applicability (IA)	Claims	

2. Citations and explanations

see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

A. Re Item V

Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

Reference is made to the following document:

D1: WO 98/10538

The document D1 was not cited in the international search report. A copy of the document is appended hereto.

1. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 1**, a method for location control (see page 1, lines 7-8) in a cellular telecommunication system (see page 10, lines 26-30; Fig. 2) supporting macro diversity connections (see page 17, lines 12-14; page 19, lines 14-19; page 22, lines 29-33; page 31, lines 3-16), wherein priority levels are assigned to the cells of the active set of a macro diversity connection (see page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 48, line 29 to page 49, line 8; page 55, lines 26-29; page 57, lines 18-19) and the location of a mobile station is determined based on said priority levels (page 11, lines 25-27; page 37, lines 15-18; page 57, lines 19-20).

The subject-matter of claim 1 therefore is not new, Article 33(2) PCT.

2. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 20**, a mobile station for a cellular telecommunication system comprising a cellular network (see page 10, lines 26-30; Fig. 2), which mobile station has means for communicating using macro diversity connections in which the mobile station communicates with the cellular network via a plurality of cells (see page 17, lines 12-14; page 19, lines 14-19; page 22, lines 29-33; page 31, lines 3-16), wherein the mobile station comprises receiving means for receiving information for construction of a priority order for the plurality of cells (see page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 37, lines 15-18; page 57, lines 18-19) and selecting means for selecting a

master cell at least partly on the basis of said priority order (see page 11, lines 13-16; page 57, lines 19-20).

The subject-matter of claim 20 therefore is not new, Article 33(2) PCT.

3. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 22**, a system in a cellular telecommunication system (see page 10, lines 26-30; Fig. 2) arranged to receive information specifying a master cell from a mobile station (see page 11, lines 13-16; page 57, lines 18-20) and to indicate the specified cell as the location of the mobile station to the core network of the cellular telecommunication system (see page 24, lines 19-21; page 24, lines 28-31).

The subject-matter of claim 22 therefore is not new, Article 33(2) PCT.

4. It should furthermore be noted that even if novelty of claims 1, 20 and 22 could be argued, based on minor differences between the features of said claims and those disclosed in document D1, the subject-matter of claims 1, 20 and 22 would not involve an inventive step, Article 33(3) PCT, having regard to the disclosure of document D1 and the normal knowledge of a person skilled in the art of location management in cellular telecommunication systems.
5. Furthermore, dependent **claims 2 to 19, 21, 23 and 24** do not appear to contain any additional features which in combination with the features of any claim to which they refer, involve an inventive step for the reason that the subject-matter of said claims is either in principle directly derivable from the disclosure of document **D1** (for **claims 4 and 8**: see page 43, lines 21-25; page 56, lines 2-3; for **claim 6**: see page 13, lines 18-21; page 27, lines 24-31; page 57, lines 18-20; for **claims 10 and 18**: see page 23, lines 24-27; page 29, lines 29-32; for **claim 11**: see page 67, lines 14-17) or represents simple design details which are generally known to a person skilled in the field of location management in cellular telecommunication systems.

Thus, dependent claims 2 to 19, 21, 23 and 24 do not meet the requirements of Article 33(3) PCT.

B. Re Item VII

Certain defects in the international application

1. The independent claims should be drafted in the proper two-part form recommended by Rule 6.3.(b),(i),(ii) PCT, having a preamble that correctly reflects the nearest prior art, being represented by the above noted document D1.
2. All the claims should include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.
3. In order to meet the requirements of Rule 5.1.(a),(ii) PCT, the relevant prior art, i.e. the document D1 noted above, should be acknowledged by reference and briefly discussed in the introductory part of the description.
4. The general "spirit" statement in the description at page 15, line 6 is unclear, and when used to interpret the claims renders them also unclear, contrary to Article 6 PCT. The statement should therefore be deleted.
5. The attention of the applicant is drawn to the fact that the application may not be amended in such a way that it contains subject-matter which extends beyond the content of the application as originally filed, Article 34(2)(b) PCT.
6. In order to facilitate the examination of the conformity of the amended application with the requirements of Article 34(2)(b) PCT, the applicant is requested to clearly identify the amendments carried out, no matter whether they concern amendments by addition, replacement or deletion, and to indicate the passages of the application as filed on which these amendments are based, Rule 66.8(a) PCT.
7. Amendments should be filed by way of replacement pages in the manner stipulated by Rule 66.8(a) PCT. In particular, fair copies of the amendments should be filed preferably in triplicate. Moreover, the applicant's attention is drawn to the fact that, as a consequence of Rule 66.8(a) PCT the examiner is not permitted to carry out any amendments under the PCT procedure, however minor these may be.

C. Re Item VIII

Certain observations on the international application

1. The feature "... **the** active set ..." in line 3 of **claim 1** is not clear, Article 6 PCT, since said feature has not been previously defined in said claim, i.e. said feature has no antecedent.

The same objection is also valid for "... **the** network ... " of **claim 2**.

2. The term "... at least partially ..." in **claims 1, 15 to 18 and 20** is unclear as it introduces inexactness into quantities or expressions and so leaves the reader in doubt as to the exact meaning of features qualified by such terms. Therefore, this term should be deleted, Article 6 PCT.
3. The vague expression in **claims 20 and 22** "... master cell ..." is not clear since these expression does not have any precise or well-recognised technical meaning, Article 6 PCT.
The claim should be amended to include a short explanation of said term, or the objectionable term should be replaced by terms having a generally known and accepted technical meaning.

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 49170		FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00969	International filing date (day/month/year) 24/11/1999	Priority date (day/month/year) 25/11/1998	
International Patent Classification (IPC) or national classification and IPC H04Q7/00			
Applicant NOKIA NETWORKS OY et al.			

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 7 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 12/06/2000	Date of completion of this report 31.01.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Banerjee, R Telephone No. +49 89 2399 7467



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00969

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-14	as originally filed			
15	as received on	23/10/2000	with letter of	20/10/2000

Claims, No.:

1-24	as received on	23/10/2000	with letter of	20/10/2000
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Drawings, sheets:

1/3-3/3	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00969

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims
	No:	Claims 1, 20, 22
Inventive step (IS)	Yes:	Claims
	No:	Claims 1-24
Industrial applicability (IA)	Yes:	Claims 1-24
	No:	Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

A. Citations and explanations in respect of paragraph V:

1. Reference is made to the following document:

D1: WO 98/10538

The document D1 was not cited in the international search report.

2. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 1**, a method for location management (see page 1, lines 7-8; note that the term "location" as such is generally interpreted as "physical" location and not as "administrative" location; accordingly, the broad term "management" would also be interpreted as "control") in a cellular telecommunication system (see page 10, lines 26-30; Fig. 2) supporting macro diversity connections (see page 17, lines 12-14; page 19, lines 14-19; page 22, lines 29-33; page 31, lines 3-16), wherein regarding a macro diversity situation it comprises the steps of assigning priority levels to the cells of an active set of a macro diversity connections (see page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 48, line 29 to page 49, line 8; page 55, lines 26-29; page 57, lines 18-19) and at least partly based on the priority levels, determining a cell to be used as the location of the mobile station (see page 11, lines 25-27; page 22, lines 13-16; page 37, lines 15-18; page 57, lines 19-20).

The subject-matter of claim 1 therefore is not new, Article 33(2) PCT.

3. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 20**, a mobile station for a cellular telecommunication system comprising a cellular network (see page 10, lines 26-30; Fig. 2), which mobile station has means for communicating using macro diversity connections in which the mobile station communicates with the cellular network via a plurality of cells (see page 17, lines 12-14; page 19, lines 14-19; page 22, lines 29-33; page 31, lines 3-16), said means for communicating comprising receiving means arranged to receive information for construction of a priority order for the plurality of cells with which the mobile station communicates in a macro diversity connection (see

page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 37, lines 15-18; page 57, lines 18-19), and the mobile station comprises selecting means that are arranged to select a master cell to be used as the location of the mobile station at least partly on the basis of said priority order (see page 22, lines 13-16; page 57, lines 19-20).

The subject-matter of claim 20 therefore is not new, Article 33(2) PCT.

4. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 22**, a system for location management in a cellular telecommunication system (see page 10, lines 26-30; Fig. 2; note that the term "location" as such is generally interpreted as "physical" location and not as "administrative" location; accordingly, the broad term "management" would also be interpreted as "control"), the system is arranged to transmit to a mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection (see page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 37, lines 15-18; page 57, lines 18-19), and the system is arranged to receive from a mobile station, after having transmitted to said mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection information specifying a master cell (see page 22, lines 13-16; page 57, lines 18-20) and to indicate the specified cell as the location of the mobile station to a core network of the cellular telecommunication system (see page 24, lines 19-21; page 24, lines 28-31).

The subject-matter of claim 22 therefore is not new, Article 33(2) PCT.

5. It should furthermore be noted that even if novelty of claims 1, 20 and 22 could have been argued, based on minor differences between the features of said claims and those disclosed in document D1, the subject-matter of claims 1, 20 and 22 would not have involved an inventive step, Article 33(3) PCT, having regard to the disclosure of document D1 and the normal knowledge of a person skilled in the art of location management in cellular telecommunication systems.

6. Furthermore, dependent **claims 2 to 19, 21, 23 and 24** do not appear to contain any additional features which in combination with the features of any claim to which they refer, involve an inventive step for the reason that the subject-matter of said claims is either in principle directly derivable from the disclosure of document **D1** (for **claims 4 and 8**: see page 43, lines 21-25; page 56, lines 2-3; for **claim 6**: see page 13, lines 18-21; page 27, lines 24-31; page 57, lines 18-20; for **claims 10 and 18**: see page 23, lines 24-27; page 29, lines 29-32; for **claim 11**: see page 67, lines 14-17) or represents simple design details which are generally known to a person skilled in the field of location management in cellular telecommunication systems.

Thus, dependent claims 2 to 19, 21, 23 and 24 do not meet the requirements of Article 33(3) PCT.

B. Remarks made in respect of paragraph VII:

1. The independent claims should have been drafted in the proper two-part form recommended by Rule 6.3.(b),(i),(ii) PCT, having a preamble that correctly reflects the nearest prior art, being represented by the above noted document D1.
2. The claims do not include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.
3. Following typing error is present in **claim 1**:
- lines 4-5: "... set of macro diversity connection ..." should have been amended in "... set of macro diversity connections ...".
4. In order to meet the requirements of Rule 5.1.(a),(ii) PCT, the relevant prior art, i.e. the document D1 noted above, should have been acknowledged by reference and briefly discussed in the introductory part of the description.

C. Remarks made in respect of paragraph VIII:

The following amendments would have been necessary to the claims:

1. **Claims 1, 20 and 22**, respectively, do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The following functional statements do not enable the skilled person to determine which technical features are necessary to perform the stated function: "... assigning priority levels to the cells ..." or "... construction of a priority order for the plurality of cells ...".
2. The term "... at least partially ..." in **claims 1, 15 to 18 and 20** is unclear as it introduces inexactness into quantities or expressions and so leaves the reader in doubt as to the exact meaning of features qualified by such terms. Therefore, this term should be deleted, Article 6 PCT.
3. The feature "... **the network** ..." of **claim 2** is not clear, Article 6 PCT, since said feature has not been previously defined in said claim or in any claim on which said claim depends, i.e. said feature has no antecedent.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be apparent that many modifications and variations thereto are possible.

5

Claims

1. A method for location management in a cellular telecommunication system supporting macro diversity connections, **characterised** in that, regarding a macro
5 diversity situation it comprises the steps of:
- assigning priority levels to the cells of an active set of a macro diversity connection, and
- at least partly based on the priority levels, determining a cell to be used as the location of the mobile station.
- 10 2. A method according to claim 1, **characterised** in that each of the cells used in a macro diversity connection between a mobile station and the network is classified as being in a serving cell set or outside said serving cell set.
- 15 3. A method according to claim 2, **characterised** in that one of the cells in the serving cell set is selected to be a master cell.
4. A method according to claim 3, **characterised** in that said selection is performed by the network.
- 20 5. A method according to claim 4, **characterised** in that the network performs the selection of the master cell as a response to a message received from the mobile station, which message does not contain an indication of a master cell.
- 25 6. A method according to claim 3, **characterised** in that said selection is performed according to a predefined rule.
7. A method according to claim 6, **characterised** in that
30 the cell of the serving cell set which has been in the active set for the longest time is selected to be the master cell.
8. A method according to claim 3, **characterised** in that said selection is performed by the mobile station.
- 35 9. A method according to claim 8, **characterised** in that the cell selected by the mobile station is indicated to the network in a message sent by the mobile station.

10. A method according to claim 8, **characterised in that**

- the mobile station requests location information from the network,
- the mobile station receives a response to the request from the network, and
- 5 - the selection of the master cell is performed at least partly based on said response.

11. A method according to claim 8, **characterised in that**

said selection is performed at least partly on the basis of information about localised services of the network stored in the mobile station.

10

12. A method according to claim 1, **characterised in that**

the priority levels of the cells in the active set are changed as a response to serving RNC relocation.

15

13. A method according to claim 2, **characterised in that**

as a response to serving RNC relocation, the cells of the active set which were designated as being in the serving cell set are designated as being outside the serving cell set, and the cells of the active set which were designated as being outside the serving cell set are designated as being in the serving cell set.

20

14. A method according to claim 2, **characterised in that**

the mobile station designates those cells of the active set as being in the serving cell set, which cells are listed in a message received from the network informing the mobile station about a serving RNC relocation, and designates other cells of the

25

15. A method according to claim 2 used in a cellular telecommunication system comprising a first network element for controlling circuit switched connections and a second network element for controlling packet switched connections,

30

characterised in that

when a mobile station has an active connection to a first of the first and second network elements and no active connections to a second of the first and second network elements,

a location update to said second of the first and second network elements is performed at least partly as a response to a change in said serving cell set.

35

16. A method according to claim 15, **characterised in that**

said location update is performed at least partly as a response to the changing of all cells in the serving cell set.

5 17. A method according to claim 15, characterised in that
said location updates are performed at least partly as a response to removing of the last of those cells in the serving cell set, which cells were in the serving cell set when a location update was performed the previous time.

10 18. A method according to claim 15, characterised in that
the method comprises steps, in which
- the mobile station requests location information from the network,
- the mobile station receives a response to the request from the network, and
- the mobile station makes a decision about whether or not to perform a location
15 update to said second of the first and second network elements at least partly based
on said response.

20 19. A method according to claim 2 used in a cellular telecommunication system
comprising a first network element for controlling circuit switched connections and
a second network element for controlling packet switched connections,
characterised in that
when a mobile station has an active connection to a first of the first and second
network elements and no active connections to a second of the first and second
network elements, a location update to said first of the first and second network
elements is performed at least partly as a response to a change in said serving cell
25 set.

30 20. A mobile station for a cellular telecommunication system comprising a cellular
network, which mobile station has means for communicating using macro diversity
connections in which the mobile station communicates with the cellular network via
a plurality of cells, said means for communicating comprising receiving means,
characterised in that
- the receiving means are arranged to receive information for construction of a
priority order for the plurality of cells with which the mobile station communicates
in a macro diversity connection, and
35 - the mobile station comprises selecting means that are arranged to select a master
cell to be used as the location of the mobile station at least partly on the basis of said
priority order.

21. A mobile station according to claim 20, **characterised** in that the mobile station further comprises means for indicating the selected master cell to the network.

- 5 22. A system for location management in a cellular telecommunication system, **characterised** in that
- the system is arranged to transmit to a mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection, and
 - 10 - the system is arranged to receive from a mobile station, after having transmitted to said mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection, information specifying a master cell and to indicate the specified cell as the location of the mobile station to a core network of the cellular
 - 15 telecommunication system.

23. A system according to claim 22, **characterised** in that the system is located in a radio access network of the cellular telecommunication system.

20

24. A system according to claim 23, **characterised** in that the system is located in the radio network controller of said radio access network.

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

15

Applicant's or agent's file reference 49170	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI99/00969	International filing date (day/month/year) 24/11/1999	Priority date (day/month/year) 25/11/1998
International Patent Classification (IPC) or national classification and IPC H04Q7/00		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.


2. This REPORT consists of a total of 7 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 12/06/2000	Date of completion of this report 31.01.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Banerjee, R Telephone No. +49 89 2399 7467



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00969

I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

Description, pages:

1-14	as originally filed			
15	as received on	23/10/2000	with letter of	20/10/2000

Claims, No.:

1-24	as received on	23/10/2000	with letter of	20/10/2000
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Drawings, sheets:

1/3-3/3	as originally filed
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2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00969

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims
	No:	Claims 1, 20, 22
Inventive step (IS)	Yes:	Claims
	No:	Claims 1-24
Industrial applicability (IA)	Yes:	Claims 1-24
	No:	Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

A. Citations and explanations in respect of paragraph V:

1. Reference is made to the following document:

D1: WO 98/10538

The document D1 was not cited in the international search report.

2. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 1**, a method for location management (see page 1, lines 7-8; note that the term "location" as such is generally interpreted as "physical" location and not as "administrative" location; accordingly, the broad term "management" would also be interpreted as "control") in a cellular telecommunication system (see page 10, lines 26-30; Fig. 2) supporting macro diversity connections (see page 17, lines 12-14; page 19, lines 14-19; page 22, lines 29-33; page 31, lines 3-16), wherein regarding a macro diversity situation it comprises the steps of assigning priority levels to the cells of an active set of a macro diversity connections (see page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 48, line 29 to page 49, line 8; page 55, lines 26-29; page 57, lines 18-19) and at least partly based on the priority levels, determining a cell to be used as the location of the mobile station (see page 11, lines 25-27; page 22, lines 13-16; page 37, lines 15-18; page 57, lines 19-20).

The subject-matter of claim 1 therefore is not new, Article 33(2) PCT.

3. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 20**, a mobile station for a cellular telecommunication system comprising a cellular network (see page 10, lines 26-30; Fig. 2), which mobile station has means for communicating using macro diversity connections in which the mobile station communicates with the cellular network via a plurality of cells (see page 17, lines 12-14; page 19, lines 14-19; page 22, lines 29-33; page 31, lines 3-16), said means for communicating comprising receiving means arranged to receive information for construction of a priority order for the plurality of cells with which the mobile station communicates in a macro diversity connection (see

page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 37, lines 15-18; page 57, lines 18-19), and the mobile station comprises selecting means that are arranged to select a master cell to be used as the location of the mobile station at least partly on the basis of said priority order (see page 22, lines 13-16; page 57, lines 19-20).

The subject-matter of claim 20 therefore is not new, Article 33(2) PCT.

4. Document **D1** (see in particular page 1-57; Fig. 2) discloses, according to **all** the features of **claim 22**, a system for location management in a cellular telecommunication system (see page 10, lines 26-30; Fig. 2; note that the term "location" as such is generally interpreted as "physical" location and not as "administrative" location; accordingly, the broad term "management" would also be interpreted as "control"), the system is arranged to transmit to a mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection (see page 11, lines 21-26; page 22, lines 1-8; page 27, lines 24-31; page 28, lines 17-21; page 37, lines 15-18; page 57, lines 18-19), and the system is arranged to receive from a mobile station, after having transmitted to said mobile station information for construction of a priority order for the plurality of cells with which said mobile station communicates in a macro diversity connection information specifying a master cell (see page 22, lines 13-16; page 57, lines 18-20) and to indicate the specified cell as the location of the mobile station to a core network of the cellular telecommunication system (see page 24, lines 19-21; page 24, lines 28-31).

The subject-matter of claim 22 therefore is not new, Article 33(2) PCT.

5. It should furthermore be noted that even if novelty of claims 1, 20 and 22 could have been argued, based on minor differences between the features of said claims and those disclosed in document D1, the subject-matter of claims 1, 20 and 22 would not have involved an inventive step, Article 33(3) PCT, having regard to the disclosure of document D1 and the normal knowledge of a person skilled in the art of location management in cellular telecommunication systems.

6. Furthermore, dependent **claims 2 to 19, 21, 23 and 24** do not appear to contain any additional features which in combination with the features of any claim to which they refer, involve an inventive step for the reason that the subject-matter of said claims is either in principle directly derivable from the disclosure of document **D1** (for **claims 4 and 8**: see page 43, lines 21-25; page 56, lines 2-3; for **claim 6**: see page 13, lines 18-21; page 27, lines 24-31; page 57, lines 18-20; for **claims 10 and 18**: see page 23, lines 24-27; page 29, lines 29-32; for **claim 11**: see page 67, lines 14-17) or represents simple design details which are generally known to a person skilled in the field of location management in cellular telecommunication systems.

Thus, dependent claims 2 to 19, 21, 23 and 24 do not meet the requirements of Article 33(3) PCT.

B. Remarks made in respect of paragraph VII:

1. The independent claims should have been drafted in the proper two-part form recommended by Rule 6.3.(b),(i),(ii) PCT, having a preamble that correctly reflects the nearest prior art, being represented by the above noted document D1.
2. The claims do not include reference signs in parentheses where features shown in the drawings are referred to, Rule 6.2.(b) PCT.
3. Following typing error is present in **claim 1**:
- lines 4-5: "... set of macro diversity connection ..." should have been amended in "... set of macro diversity connections ...".
4. In order to meet the requirements of Rule 5.1.(a),(ii) PCT, the relevant prior art, i.e. the document D1 noted above, should have been acknowledged by reference and briefly discussed in the introductory part of the description.

C. Remarks made in respect of paragraph VIII:

The following amendments would have been necessary to the claims:

1. **Claims 1, 20 and 22**, respectively, do not meet the requirements of Article 6 PCT in that the matter for which protection is sought is not clearly defined. The following functional statements do not enable the skilled person to determine which technical features are necessary to perform the stated function: "... assigning priority levels to the cells ..." or "... construction of a priority order for the plurality of cells ...".
2. The term "... at least partially ..." in **claims 1, 15 to 18 and 20** is unclear as it introduces inexactness into quantities or expressions and so leaves the reader in doubt as to the exact meaning of features qualified by such terms. Therefore, this term should be deleted, Article 6 PCT.
3. The feature "... **the** network ..." of **claim 2** is not clear, Article 6 PCT, since said feature has not been previously defined in said claim or in any claim on which said claim depends, i.e. said feature has no antecedent.

PCT REQUEST

49170

Original (for SUBMISSION) - printed on 24.11.1999 11:03:06 AM

0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2.84 (updated 01.07.1999)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	National Board of Patents and Registration (Finland) (RO/FI)
0-7	Applicant's or agent's file reference	49170
I	Title of invention	LOCATION MANAGEMENT METHOD
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	NOKIA NETWORKS OY
II-5	Address:	P.O. Box 300 FIN-00045 Nokia Group Finland
II-6	State of nationality	FI
II-7	State of residence	FI
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	RAJANIEMI, Jaakko
III-1-5	Address:	Lapinrinne 2 A 11 FIN-00180 Helsinki Finland
III-1-6	State of nationality	FI
III-1-7	State of residence	FI

PCT REQUEST

49170

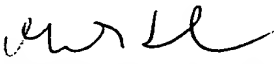
Original (for SUBMISSION) - printed on 24.11.1999 11:03:06 AM

IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	BERGGREN OY AB
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IV-1-5	e-mail	email.box@berggren.elisa.fi
V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW SD SL SZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AL AM AT AU AZ BA BB BG BR BY CA CH&LI CN CR CU CZ DE DK DM EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW

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V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE
VI-1	Priority claim of earlier national application	
VI-1-1	Filing date	25 November 1998 (25.11.1998)
VI-1-2	Number	982556
VI-1-3	Country	FI
VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1
VII-1	International Searching Authority Chosen	European Patent Office (EPO) (ISA/EP)
VIII	Check list	number of sheets electronic file(s) attached
VIII-1	Request	4 -
VIII-2	Description	15 -
VIII-3	Claims	4 -
VIII-4	Abstract	1 49170.txt
VIII-5	Drawings	3 -
VIII-7	TOTAL	27
	Accompanying items	paper document(s) attached electronic file(s) attached
VIII-8	Fee calculation sheet	✓ -
VIII-9	Separate signed power of attorney	✓ -
VIII-10	Copy of general power of attorney	✓ -
VIII-16	PCT-EASY diskette	- diskette
VIII-18	Figure of the drawings which should accompany the abstract	2
VIII-19	Language of filing of the international application	English
IX-1	Signature of applicant or agent	
IX-1-1	Name	BERGGREN OY AB
IX-1-2	Name of signatory	Markus Levlin
IX-1-3	Capacity	Patent Agent

PCT REQUEST

49170

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10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/EP
10-6	Transmittal of search copy delayed until search fee is paid	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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Location management method

TECHNICAL FIELD OF THE INVENTION

5

The invention is directed to a method for location management in cellular telecommunication systems. More precisely, the invention is directed to a method as described in the preamble of the independent method claim.

10 BACKGROUND OF THE INVENTION

Macro diversity combining refers to a situation, in which a mobile station divides one signal to more than one radio connections to more than one base stations, and the network combines the received signals to produce the original signal. Macro
15 diversity combining is advantageous especially in cellular systems, which utilise spread spectrum technology. In spread spectrum systems, many radio transmissions use simultaneously the same frequencies, whereby the total of all other transmissions is observed as background interference by a single connection. As a consequence the minimising of transmission power of mobile stations and base
20 stations is very important. The advantage of macro diversity combining is that the total transmission power of the partial connections of a macro diversity connection is generally less than the transmission power required, if the same connection were realised using only one radio connection to one base station. This is the case especially when a mobile station is near the border of a cell, i.e. when none of the
25 base stations are very near the mobile station, but more than one base stations are at roughly similar distances. Macro diversity combining will be used for example in the UMTS (Universal Mobile Telecommunications System) system presently under development.

30 Figure 1 illustrates an example of a macro diversity connection in the UMTS system. A mobile station (MS) 100 has simultaneous radio connections to two base stations 105. Base stations 105 are controlled by radio network controllers RNC1 and RNC2 110. Radio network controllers RNC1, RNC2 are in turn controlled by core network elements such as mobile services switching centres (MSC) 115 which
35 control circuit switched connections and Serving GPRS Support Nodes (SGSN) which control packet switched connections. The interface between a core network (CN) and a radio access network (RAN) i.e. between a MSC and a RNC or a SGSN and a RNC is called the Iu interface (Interface UMTS). The interface between two

radio network controllers is called the Iur interface. Figure 1 further shows two location areas LA1, LA2. A location area (LA) covers a plurality of cells under control of a single MSC.

5 As figure 1 shows, the connections of the MS 100 pass through two radio network controllers RNC1, RNC2. One of these is a so called drift RNC which merely passes all signalling through the Iur interface to the main RNC, which is called the serving RNC (SRNC). The serving RNC performs, among other duties, the actual macro diversity combining.

10

In the present GSM system, the location management is based on a cell identifier and the location area. In the GPRS system, a location area further comprises one or more routing areas (RA). Correspondingly, the location of a mobile station can be specified unambiguously with a cell identifier and a location area identifier, and in
15 GPRS, further with a routing area identifier. However, in the UMTS system this approach presents several problems. For example, in the example of figure 1 the mobile station has connections to two cells in different location areas, whereby the determination of the location is not as straightforward as in the conventional GSM system. Therefore, the use of macro diversity combination produces a degree of
20 ambiguity of the location of a mobile station.

Further, the mobile station does not necessarily know the location area and the routing area of the cells in the active set, if the network does not indicate the system information of each cell at the time, when the cell is added to the active set. This
25 creates a problem in such a situation, when a mobile station has active connections to one core network element e.g. MSC, and none to another core network element such as the SGSN, in which case the packet data entities are in idle state. In idle state, the MS should perform location updates regularly, or when the MS moves into another routing or location area. However, when the mobile station does not know
30 the location and routing areas of the cells, the determination of whether a location update should be performed poses a further problem.

SUMMARY OF THE INVENTION

35 An object of the invention is to realise a location management method, which alleviates the previously described problems of the prior art.

- The objects are reached by assigning priority levels to the cells of the active set of a macro diversity connection. There can be two or more different priority levels. A two-level priority scheme can be realised by further classifying the cells in the active set as being in a serving cell set or outside of the serving cell set. The serving cell set comprises cells, which are in the active set and which are under control of the serving RNC. One of the cells of the serving cell set is selected to be a master cell, which defines the location of the mobile station. More than two priority levels can also be used.
- 10 The method according to the invention is characterised by that, which is specified in the characterising part of the independent method claim. The mobile communication means according to the invention is characterised by that, which is specified in the characterising part of the independent claim directed to a mobile communication means. The system according to the invention is characterised by that, which is specified in the characterising part of the independent claim directed to a system. The dependent claims describe further advantageous embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

- 20 The invention is described in more detail in the following with reference to the accompanying drawings, of which
- Figure 1 illustrates a problem of the prior art,
- 25 Figure 2 is used to illustrate an advantageous embodiment of the invention,
- Figure 3 is used to illustrate a further advantageous embodiment of the invention,
- Figure 4 illustrates a mobile station according to an advantageous embodiment of the invention, and
- 30 Figure 5 illustrates a system according to an advantageous embodiment of the invention.
- 35 Same reference numerals are used for similar entities in the figures.

DETAILED DESCRIPTION

1. CELL PRIORITIES

5 According to the invention, priority levels are assigned to the cells of the active set of a macro diversity connection. The priority levels can comprise for example two distinct priority levels, i.e. prioritised and non-prioritised cells. The priority levels may be assigned for example according to certain localised services provided within
10 a certain area in the network, or for example on routing and/or location areas of the cells. As a further example, the prioritised cells can be those cells of the active set which are under control of the serving RNC, and the non-prioritised cells can be those cells which are under control of another RNC.

2. SERVING CELL SET

15 According an advantageous embodiment of the invention, the prioritisation is realised by defining a serving cell set within the active set. The serving cell set is the set of cells, which belong to the active set and are under control of the serving RNC. Since the active set may comprise one cell or a plurality of cells, and since the
20 serving RNC controls at least one cell in the active set, the serving cell set may cover the whole active set or form a subset of the active set.

The MS can use any cells that belong to the serving cell set for various network activities such as location registration or mobile originated (MO) connection
25 management (CM) service requests, and for example for paging responses through the RRC connection when the terminal already has active connections to a core network element.

3. UPDATING OF THE SERVING CELL SET

30 When the SRNC adds new cells to the active set, it indicates to the MS whether the new cell is under control of the SRNC or not, i.e. whether the new cell belongs to the serving cell set. This indication may be advantageously added to the ACTIVE SET UPDATE message of the RRC (Radio Resource Control) protocol active
35 between the MS and the SRNC, for example as a new parameter. Consequently, the serving cell set at the MS is maintained up to date. However, the invention is not limited to using the RRC ACTIVE SET UPDATE message, since the indication of the new cell being in the serving cell set may be communicated to the MS using

other messages as well. For example, a new message can be defined for that purpose.

5 The serving cell set is advantageously stored in a memory element in the MS, for example as a list or a table. A man skilled in the art knows many different ways of storing sets of information in digital memory elements, wherefore storing of sets of information is not described further in this specification.

10 Updating of the serving cell set is described in a further example according to figure 2. Figure 2 shows a mobile station 100 having a macro diversity connection through base stations BS2, BS3, and BS4 105. Base stations BS2 and BS3 are under control of radio network controller RNC1 110, while base station BS4 is under control of RNC2 110. The dashed arrows in figure 2 indicate the flow of signals in the radio access network, illustrating that RNC1 is the serving RNC in this example. Figure 2
15 further shows a MSC 115 and a SGSN 120 connected to the radio network controllers. In the example of figure 2, base stations BS2, BS3, and BS4 constitute the active set. Other base stations shown in figure 2 are not used and therefore do not belong to the active set. Base stations BS2 and BS3 belong to the serving cell set, since they are under control of the SRNC. In the case that the serving RNC
20 wishes to add for example the base station BS1 to the active set, the network would send the RRC ACTIVE SET UPDATE message to inform the MS about the addition to the active set, and indicate that the cell of base station BS1 does belong to the serving cell set. In the case that the serving RNC wishes to add for example the base station BS5 to the active set, the network would send the RRC ACTIVE
25 SET UPDATE message to inform the MS about the addition to the active set. In this case the network may explicitly indicate that the cell of base station BS5 does not belong to the serving cell set, or give the indication implicitly by not giving any indication of whether the cell of BS5 belongs to the serving cell set or not, whereby the MS can assume as a default that the cell of BS5 does not belong to the serving
30 cell set.

4. MASTER CELL

35 Preferably, one of the cells of the serving cell set is selected to be a master cell, or in other words, a current serving cell. The master cell can subsequently be used as a definition of the location of the mobile station for example in location updating and CM service request procedures, and can be specified in a RANAP (Radio Access Network Application Part) COMPLETE LAYER 3 message as the location of the

MS. The selection of a master cell has for example the advantage that it removes the location ambiguity introduced by macro diversity connections. The master cell can be selected in a wide variety of ways, some of which are described as examples below. However, the following embodiments are examples only, and do not limit the invention in any way.

However, the invention is not limited to using the COMPLETE LAYER 3 message, since the indication of the new cell being in the serving cell set may be communicated to the MS using other messages as well. For example, a new message can be defined for that purpose.

The MS can use the master cell for various network activities such as location registration or mobile originated (MO) connection management (CM) service requests, and for example for paging responses through the RRC connection when the terminal already has active connections to a core network element.

4.1 MASTER CELL SELECTION: A FIRST EXAMPLE

According to an advantageous embodiment of the invention, the master cell is selected according to a predefined rule. This embodiment has the advantage, that the master cell information does not need to be communicated either from the network to the mobile station or from the mobile station to the network, since both the network and the mobile station follow the same rule. At the network side, the selection of the master cell according to a predefined rule is preferably performed by the SRNC.

Many different types of rules can be used in various embodiments of the invention. For example, the master cell could be selected to be the cell, which has been in the active set for the longest time and is under control of the SRNC. In this embodiment, the network and the mobile station can for example record the times when a cell is added to the active set in order to determine how long a cell has been in the active set. Another way to realize such a rule is to use a queue. In such an embodiment, a cell which is added to the active set is placed at the end of the queue. If a cell is removed from the active set, it is also removed from the queue. The first cell in the queue being in the serving cell set is consequently the cell, which has been in the active set for the longest time and which is under control of the SRNC. In case the master cell is removed from the active set, a new master cell is chosen according to the rule.

The SRNC may also indicate the selected master cell to the MS in an explicit message, for example for guaranteeing that the MS and the SNRC have chosen the same cell to be the master cell.

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4.2 MASTER CELL SELECTION: A SECOND EXAMPLE

In a further advantageous embodiment of the invention, the mobile station proposes which cell of the serving cell set should be the master cell. The mobile station may advantageously indicate the desired cell for example in a location update request, a CN domain service request, or a paging response message. The indication may be included for example in a RRC level data message. This embodiment has the advantage, that the MS has the possibility to propose a master cell, if the MS has good reasons for doing so. The SRNC does not always know the most suitable cell which should be used for the MS if reasons outside the scope of control of the SRNC affect the usefulness of a certain cell.

For example, the mobile station may have a list of home cells, which should be used if possible. The home cells may have some special advantage, such as a lower billing rate, higher allowed transmission rates, or some other special services arranged by the local operator. The list of home cells may be stored for example in the USIM (UMTS Subscriber Identity Module) of the mobile station. If one or more of the home cells belongs to the serving cell set, it is advantageous if one of these cells is chosen as the master cell.

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As a further example, the cellular network may have localized services, in which certain services are provided within predefined service areas, for example within a certain cell or a group of cells. The services can for example be transmission of SMS (Short Message Service) messages to mobile stations within a certain area, such as advertising messages to mobile stations within a shopping centre. The services can for example comprise cheaper billing rates and higher transmission rates at special locations, such as within or near corporate premises. Such services are known at least as Localized Cellular Services (LCS). Typically, the mobile station has information stored in the SIM (Subscriber Identity Module) of the MS about the localized services and the cells where the services are provided, in which case the MS may advantageously use that information in the selection of a master cell.

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If the SRNC receives a proposal of the serving cell from the MS, SRNC adds an indication of the cell proposed by the MS to the RANMAP COMPLETE LAYER 3 information message. Preferably, the SRNC checks if the proposed cell belongs to the active set of the MS and it is controlled by the SRNC i.e. if the cell belongs to the serving cell set. If MS proposes a cell which is not in the serving cell set, the SRNC can choose the master cell for example according to a predefined rule.

The proposing of a master cell according to an advantageous embodiment of the invention is illustrated further in the following with reference to figure 3. Figure 3 shows a mobile station 100 having a macro diversity connection through base stations BS2 and BS3. Base stations BS2 and BS3 are under control of radio network controller RNC1 110, which is also the serving RNC in this example. Figure 2 further shows a MSC 115 and a SGSN 120 connected to RNC1.

In figure 3, the MS has e.g. a packet data connection to SGSN1 and is registered as being in location area LA1. The MS performs for example a location update by sending a LOCATION UPDATE REQUEST message to the network, for example to the MSC, which does not have active connections to the MS in this example. Attached to the message, the MS transmits the identification of the desired cell, i.e. the identifier of the cell of base station BS3. As a result, the MS is registered in the network as being located in the location area LA2 in the cell of BS3. Without the proposal of the MS, the RNC would receive the location update request from two base stations, and would need to choose the master cell by itself, for example according to a predefined rule as described previously.

The MS may send a LOCATION UPDATE REQUEST message also to a core network element, which has active connections to the MS. For example, if a MS has active packet connections to a SGSN, the MS may nevertheless send a LOCATION UPDATE REQUEST message, for example in case the MS observes that it has moved to a new routing area.

As described previously, the location update request is only an example of a situation, when a MS may propose a desired master cell. The MS may propose a cell also for example when requesting CN domain service, for example when requesting a new connection. In the example of figure 3, the MS may send a message to the MSC1 for initiating a speech connection, and indicate the desired master cell for example in a parameter attached to the message. The message may in this example be for example a SETUP message, a CM SERVICE REQUEST

message, a PAGING RESPONSE message or some other message for initiating a speech connection.

5. EFFECT OF SRNC RELOCATION

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The SRNC relocation adds extra complexity to the location management of the MS when the MS is active. In SRNC relocation, the status and duties of serving RNC is transferred from one RNC to another. In an advantageous embodiment of the invention, the priority levels of the cells in the active set are changed as a response to serving RNC relocation. Serving RNC relocation is described further for example in the Finnish patent application FI 980736.

In such an embodiment, where the prioritisation is realised by defining a serving cell set, the serving cell set needs to be changed after the SRNC relocation. This can be triggered for example by notifying the MS after SRNC relocation. For example, the new SRNC may perform the notification, as a result of which the MS updates the serving cell set to reflect the relocation of the serving RNC. The notification may be realised for example by sending a predefined message such as a SRNC RELOCATION NOTIFICATION message. After the updating of the serving cell set, one cell of the serving cell set is selected to be the master cell for example according to any of the previously described embodiments. In the following, some examples are presented of how the updating of the serving cell set is realised after a SRNC relocation.

25 5.1 A FIRST EXAMPLE

According to an advantageous embodiment of the invention, the updating of the serving cell set proceeds as follows in a situation, in which two radio network controllers participate in the macro diversity communication. After the RNC relocation signalling between for transferring the serving RNC status from a first RNC to a second RNC is finished, the second RNC sends an indication to the MS, indicating that the second RNC is now the serving RNC. As a response to receiving the indication, the mobile station examines the active set and for each cell in the active set, changes the information indicating whether the cell is in the serving cell set or not. If a cell is indicated as being a part of the serving cell set, the indication is changed to indicate that the cell is outside the serving cell set. If a cell is indicated as being outside the serving cell set, the indication is changed to indicate that the cell is in the serving cell set. In other words, those cells which are under control of

the old serving RNC are marked as being outside the serving cell set and cells under control of the new serving RNC are marked as being in the serving cell set.

5.2 A SECOND EXAMPLE

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The previous example can not be used in a situation, in which more than two radio network controllers participate in the macro diversity communication, since the serving cell set comprises cells under control of only one RNC, and the rest of the active set comprises cells under control of more than one RNC. According to a further advantageous embodiment of the invention, the new serving RNC includes information about cells into the message informing the MS about the serving RNC relocation, i.e. information based on which the MS can deduce, which cells are in the serving cell set and which are not. Preferably, the information about cells comprises at least a list of cell identifiers of those cells, which are in the active set and are under control of the new serving RNC. The information about cells may also comprise a list of all cells under control of the new serving RNC, whereby the MS can compare the received list and the active set to determine the serving cell set.

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This embodiment has the advantage, that it does not require many changes to the existing procedures. A further possibility would be to add a RNC identification to the cell identification information, whereby the mobile stations would always know which cells are under control of a given RNC. The serving cell set would then be the common subset of the active set and the set of all cells under control of the serving RNC, and the updating of the serving cell set could be performed simply on the basis of the RNC identification of the new serving RNC. However, such an approach would require quite a lot of changes to the existing procedures.

6. LOCATION UPDATING

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One possible solution to the previously described problem of when to perform location updating is to implement a multicode capability into the receiver, i.e. arrange the receiver in such a way that it can receive from more than one transmitter simultaneously, which would allow the receiver to monitor the BCCH channel, in which system information messages are transmitted by the network. Another solution would be to arrange the receiver to perform slotted mode reception, which would allow the receiving of system information messages during gaps created by the slotted mode reception. However, these solutions result in complicated receiver

structures, increasing the manufacturing cost of the mobile stations. A less complicated solution is needed.

5 According to an advantageous embodiment of the invention, a location information request procedure is used to obtain the location information, i.e. information about the current serving cell set. According to the embodiment, the mobile station may request the SRNC to send a system information message over the RRC connection active between the MS and the network. This embodiment allows the utilisation of the RRC connection which is already active due to the connection between the MS
10 and e.g. the MSC, removing the need for the packet entities in the MS to monitor BCCH channels in the hope of receiving a system information message. The system information message sent over the RRC connection may have the same format which is used on the BCCH channels, or a specific format may be defined for this purpose.

15 In a further advantageous embodiment of the invention, the SRNC may send the system information of the master cell even without explicit request from the mobile station. For example, the SRNC may send the system information of the master cell after sending some other message to the MS.

20 In another advantageous embodiment of the invention, the mobile station monitors changes in the serving cell set for deciding about when to perform location updating. Events, which may trigger the sending of a location update request by the mobile station may be for example any one of the following:

- 25 - SRNC relocation,
- change of master cell for example according to any of the previously described embodiments, especially for the packet data domain of the core network when the new master cell is within a different routing area as the previous master cell, or for example
30 - when the last cell of those cells which were in the serving cell set at the time of the previous location update is removed from the active set.

However, the previous list of events is an example only and do not limit the invention in any way. Other events may also be used for triggering the location update procedure.

35 In a further advantageous embodiment of the invention, the mobile station uses the location information request procedure at least partly for deciding about which cell

should be the master cell. The location information request procedure may in this embodiment be performed for example as described previously.

7. AN EXAMPLE OF A MOBILE STATION

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Figure 4 shows a block diagram of a digital mobile station, more generally a mobile communication means according to an advantageous embodiment of the invention. The mobile communication means comprises a microphone 301, keyboard 307, display 306, earpiece 314, antenna duplexer or switch 308, antenna 309 and a control unit 305, which all are typical components of conventional mobile communication means. Further, the mobile communication means contains typical transmission and receiver blocks 304, 311. Transmission block 304 comprises functionality necessary for speech and channel coding, encryption, and modulation, and the necessary RF circuitry for amplification of the signal for transmission. Receiver block 311 comprises the necessary amplifier circuits and functionality necessary for demodulating and decryption of the signal, and removing channel and speech coding. The signal produced by the microphone 301 is amplified in the amplifier stage 302 and converted to digital form in the A/D converter 303, whereafter the signal is taken to the transmitter block 304. The transmitter block encodes the digital signal and produces the modulated and amplified RF-signal, whereafter the RF signal is taken to the antenna 309 via the duplexer or switch 308. The receiver block 311 demodulates the received signal and removes the encryption and channel coding. The resulting speech signal is converted to analog form in the D/A converter 312, the output signal of which is amplified in the amplifier stage 313, whereafter the amplified signal is taken to the earpiece 314. The control unit 305 controls the functions of the mobile communication means, reads the commands given by the user via the keypad 307 and displays messages to the user via the display 307. The mobile station is able to communicate with the network using macro diversity connections, i.e. has means 305,304,308,309,311 for communicating with the network using macro diversity connections. The mobile station further comprises receiving means 320 for receiving information for construction of a priority order for the plurality of cells, and selecting means 321 for selecting a master cell at least partly on the basis of said priority order. Preferably the mobile station further comprises means 322 for indicating the selected master cell to the network. Preferably the receiving means 320 for receiving information for construction of a priority order, the selecting means, and the means for indicating are realised using software programs stored in a memory element of the control unit 305 and executed by a microprocessor of the control unit 305.

8. AN EXAMPLE OF A SYSTEM

Fig. 5 shows a block diagram of a cellular telecommunication system. The core network of a cellular radio system comprises mobile services switching centres (MSC), other network elements (in GSM, e.g. SGSN and GGSN, i.e. Serving GPRS Support Node and Gateway GPRS Support node, where GPRS stands for General Packet Radio Service) and the related transmission systems. In Fig. 5, the core network of a cellular telecommunication system 930 comprises a core network CN 931 which has three parallel radio access networks linked to it. Of those, networks 932 and 933 are UMTS radio access networks and network 934 is a GSM radio access network. The upper UMTS radio access network 932 is e.g. a commercial radio access network, owned by a telecommunications operator offering mobile services, which equally serves all subscribers of said telecommunications operator. The lower UMTS radio access network 933 is e.g. private and owned e.g. by a company in whose premises said radio access network operates. Typically the cells of the private radio access network 933 are nano- and/or picocells in which only terminals of the employees of said company can operate. All three radio access networks may have cells of different sizes offering different types of services. Additionally, cells of all three radio access networks 932, 933 and 934 may overlap either entirely or in part.

The terminal 10 shown in Fig. 5 is preferably a so-called dual-mode terminal that can serve either as a second-generation GSM terminal or as a third-generation UMTS terminal according to what kind of services are available at each particular location and what the user's communication needs are. It may also be a multimode terminal that can function as terminal of several different communications systems according to need and the services available. Radio access networks and services available to the user are specified in a subscriber identity module 936 (SIM) connected to the terminal.

Figure 5 further shows some details of the structure of a radio access network. A radio access network 932, 934 typically comprises one or more base stations 937 and a controlling unit 42. In UMTS radio access networks 932, 933 the controlling unit is called the radio network controller (RNC), and in GSM networks 934 the controlling unit is called a base station controller (BSC). The radio access networks typically comprise also other network elements such as transcoder units. Figure 5 further shows a mobile services switching centres (MSC) 43 which basically

controls circuit-switched connections of mobile stations 10 and a Serving GPRS Support Node (SGSN) 41 which basically controls packet switched connections of mobile stations 10.

5 According to the invention, the cellular telecommunication system 20 comprises a system 200, which is arranged to receive information specifying a master cell from a mobile station, and to indicate the specified cell as the location of the mobile station to the core network of the cellular telecommunication system. Preferably, the system 200 is located in a radio access network 932 of the cellular
10 telecommunication system. The system may advantageously be located in the radio network controller 42 of the radio access network 932. The system 200 may advantageously be realised using software programs stored in a memory element of the control unit of the radio network controller and executed by a processor unit of the control unit of the radio network controller. However, the system 200 may also
15 be realised in a separate network element, such as a macro diversity combiner (MDC) unit. Further, in such an embodiment in which the macro diversity combining is performed in a MDC which is realised as a separate network element from the radio network controller, the functions of the system 200 may be implemented partly in the RNC and partly in the MDC. The MDC unit or the
20 corresponding functionality may also be realised within the RNC, in which case the RNC performs the macro diversity combining and preferably comprises the system 200.

9. FURTHER CONSIDERATIONS

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The invention may advantageously be used in third generation cellular systems such as the UMTS cellular telecommunication system. However, the invention may also be used in other cellular systems.

30 The name of a given functional entity, such as the radio network controller, is often different in the context of different cellular telecommunication systems. For example, in the GSM system the functional entity corresponding to a radio network (RNC) is the base station controller (BSC). Therefore, the term radio network controller in the claims is intended to cover all corresponding functional entities
35 regardless of the term used for the entity in the particular cellular telecommunication system. Further, the various message names such as the ACTIVE SET UPDATE message name are intended to be examples only, and the invention is not limited to using the message names recited in this specification.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention. While a preferred embodiment of the invention has been described in detail, it should be
5 apparent that many modifications and variations thereto are possible, all of which fall within the true spirit and scope of the invention.

Claims

1. A method for location control in a cellular telecommunication system supporting macro diversity connections, **characterised in that**
5 priority levels are assigned to the cells of the active set of a macro diversity connection, and
the location of a mobile station is determined at least partly based on said priority levels.
- 10 2. A method according to claim 1, **characterised in that**
each of the cells used in a macro diversity connection between a mobile station and the network is classified as being in a serving cell set or outside said serving cell set.
3. A method according to claim 2, **characterised in that**
15 one of the cells in the serving cell set is selected to be a master cell.
4. A method according to claim 3, **characterised in that**
said selection is performed by the network.
- 20 5. A method according to claim 4, **characterised in that**
the network performs the selection of the master cell as a response to a message received from the mobile station, which message does not contain an indication of a master cell.
- 25 6. A method according to claim 3, **characterised in that**
said selection is performed according to a predefined rule.
7. A method according to claim 6, **characterised in that**
the cell of the serving cell set which has been in the active set for the longest time is
30 selected to be the master cell.
8. A method according to claim 3, **characterised in that**
said selection is performed by the mobile station.
- 35 9. A method according to claim 8, **characterised in that**
the cell selected by the mobile station is indicated to the network in a message sent by the mobile station.

10. A method according to claim 8, characterised in that

- the mobile station requests location information from the network,
- the mobile station receives a response to the request from the network, and
- the selection of the master cell is performed at least partly based on said response.

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11. A method according to claim 8, characterised in that

said selection is performed at least partly on the basis of information about localised services of the network stored in the mobile station.

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12. A method according to claim 1, characterised in that

the priority levels of the cells in the active set are changed as a response to serving RNC relocation.

13. A method according to claim 2, characterised in that

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as a response to serving RNC relocation, the cells of the active set which were designated as being in the serving cell set are designated as being outside the serving cell set, and the cells of the active set which were designated as being outside the serving cell set are designated as being in the serving cell set.

20

14. A method according to claim 2, characterised in that

the mobile station designates those cells of the active set as being in the serving cell set, which cells are listed in a message received from the network informing the mobile station about a serving RNC relocation, and designates other cells of the active set as being outside the serving cell set.

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15. A method according to claim 2 used in a cellular telecommunication system comprising a first network element for controlling circuit switched connections and a second network element for controlling packet switched connections, characterised in that

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when a mobile station has an active connection to a first of the first and second network elements and no active connections to a second of the first and second network elements,

a location update to said second of the first and second network elements is performed at least partly as a response to a change in said serving cell set.

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16. A method according to claim 15, characterised in that

said location update is performed at least partly as a response to the changing of all cells in the serving cell set.

17. A method according to claim 15, **characterised** in that said location updates are performed at least partly as a response to removing of the last of those cells in the serving cell set, which cells were in the serving cell set when a location update was performed the previous time.

18. A method according to claim 15, **characterised** in that the method comprises steps, in which

- the mobile station requests location information from the network,
- 10 - the mobile station receives a response to the request from the network, and
- the mobile station makes a decision about whether or not to perform a location update to said second of the first and second network elements at least partly based on said response.

15 19. A method according to claim 2 used in a cellular telecommunication system comprising a first network element for controlling circuit switched connections and a second network element for controlling packet switched connections, **characterised** in that when a mobile station has an active connection to a first of the first and second

20 network elements and no active connections to a second of the first and second network elements, a location update to said first of the first and second network elements is performed at least partly as a response to a change in said serving cell set.

25 20. A mobile station for a cellular telecommunication system comprising a cellular network, which mobile station has means for communicating using macro diversity connections in which the mobile station communicates with the cellular network via a plurality of cells, **characterised** in that the mobile station comprises receiving means for receiving information for construction of a priority order for the

30 plurality of cells, and selecting means for selecting a master cell at least partly on the basis of said priority order.

21. A mobile station according to claim 20, **characterised** in that the mobile station further comprises means for indicating the selected master cell to

35 the network.

22. A system in a cellular telecommunication system, **characterised in that** the system is arranged to receive information specifying a master cell from a mobile station, and to indicate the specified cell as the location of the mobile station to the core network of the cellular telecommunication system.

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23. A system according to claim 22, **characterised in that** the system is located in a radio access network of the cellular telecommunication system.

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24. A system according to claim 23, **characterised in that** the system is located in the radio network controller of said radio access network.

(57) Abstract

The invention is directed to a method for location management in cellular telecommunication systems. In the inventive method, priority levels are assigned to the cells of the active set of a macro diversity connection. There can be two or more different priority levels. A two-level priority scheme can be realised by further classifying the cells in the active set as being in a serving cell set or outside of the serving cell set. The serving cell set comprises cells, which are in the active set and which are under control of the serving RNC. One of the cells of the serving cell set is selected to be a master cell, which defines the location of the mobile station. More than two priority levels can also be used.

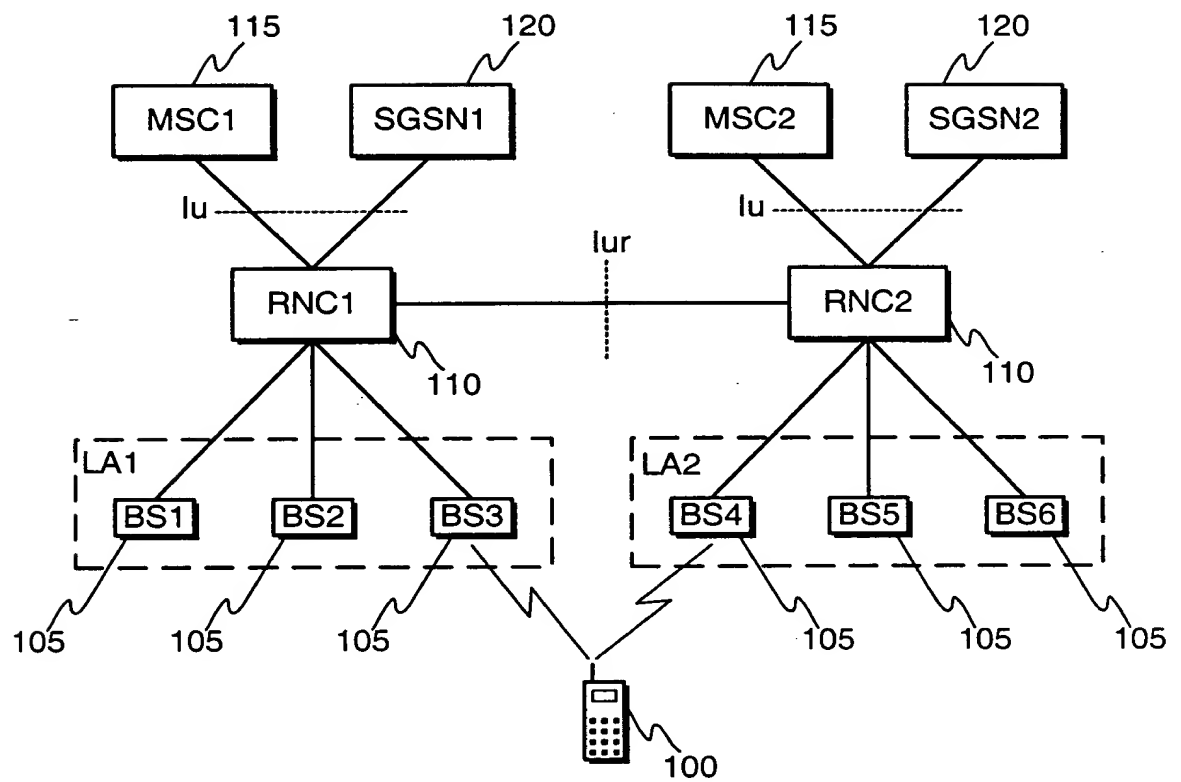


Fig. 1
PRIOR ART

2 / 3

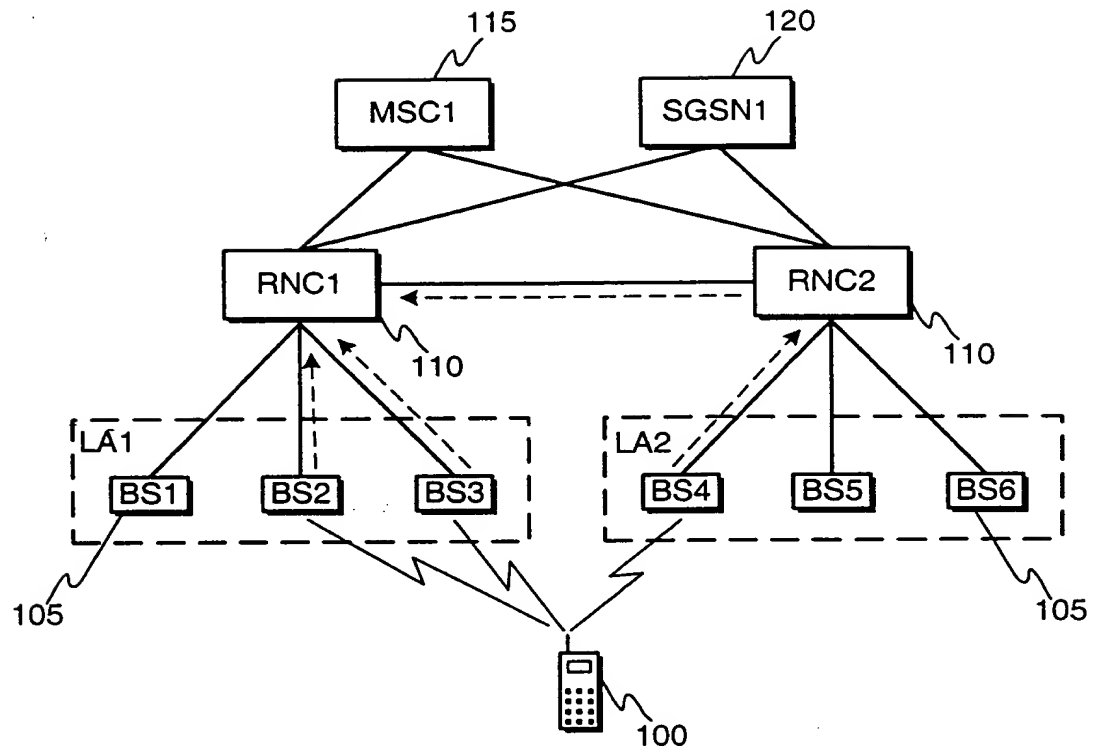


Fig. 2

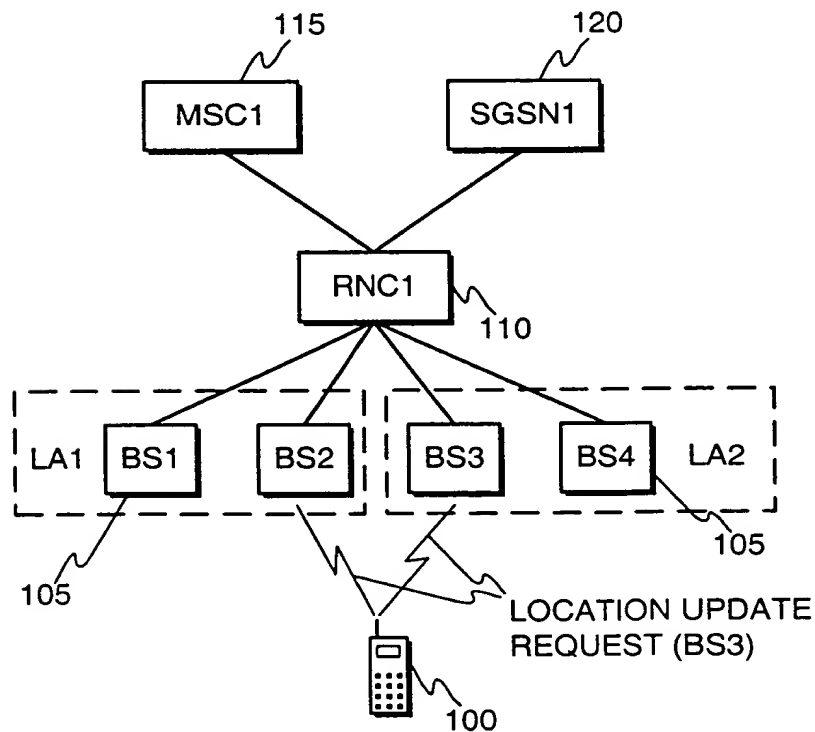


Fig. 3

3 / 3

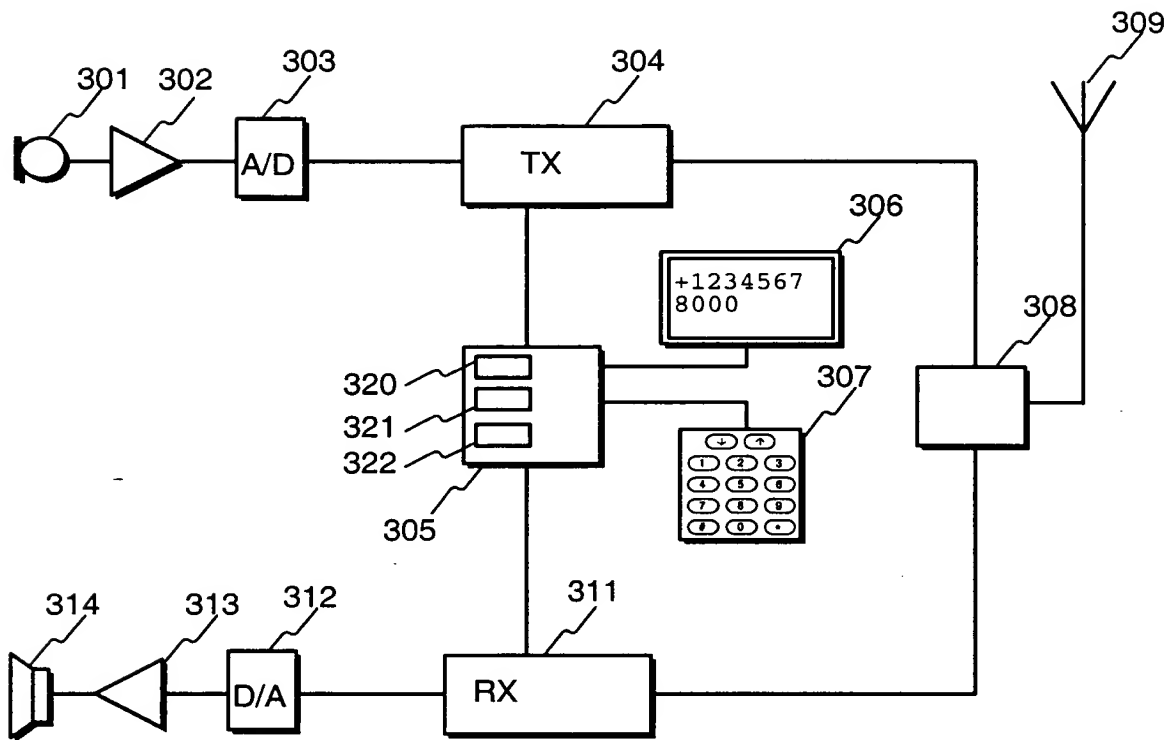


Fig.4

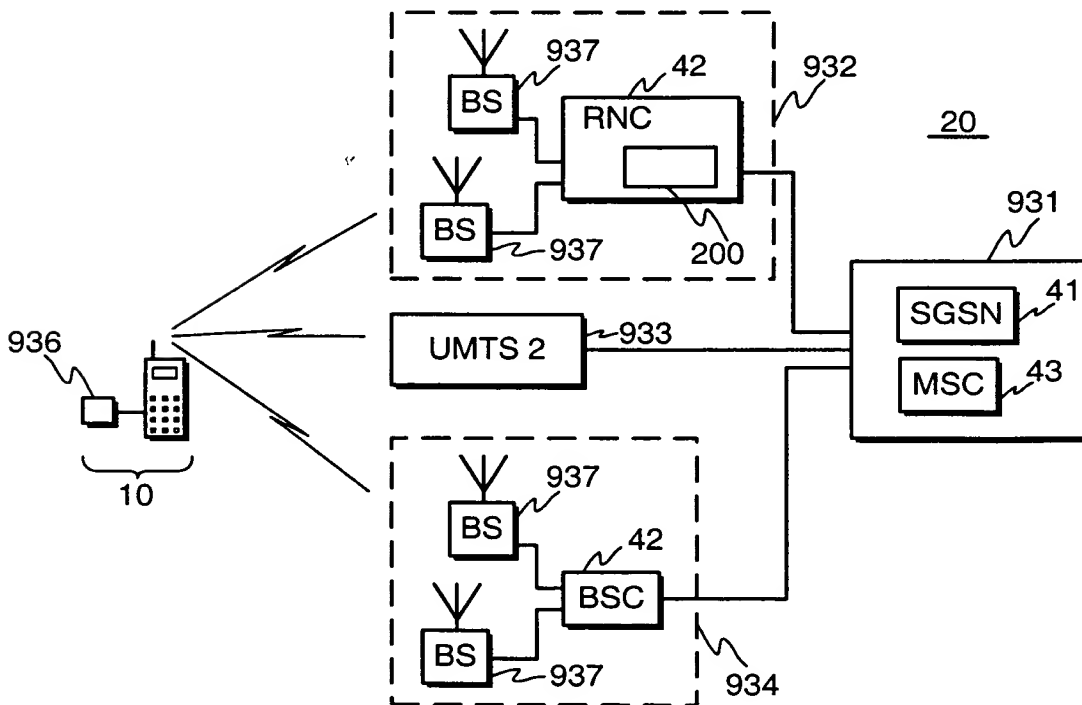
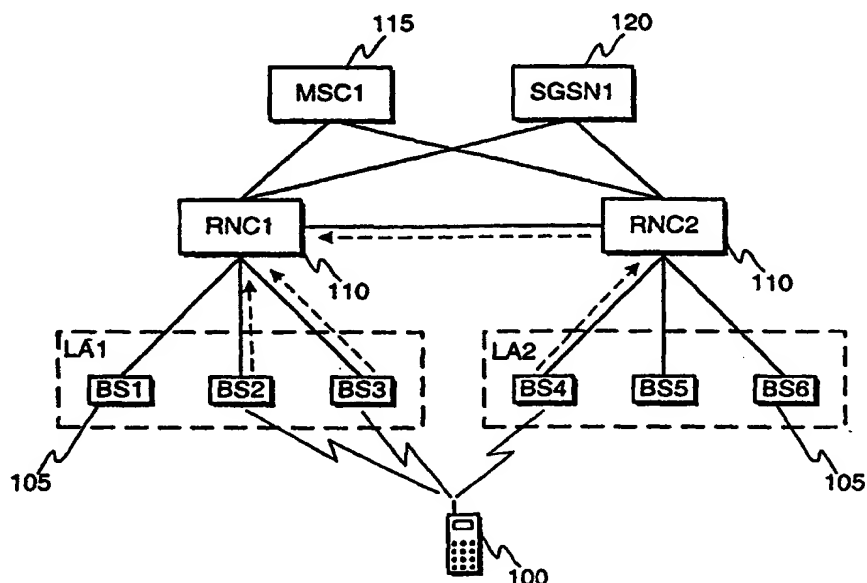


Fig. 5



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(21) International Application Number: PCT/FI99/00969 (22) International Filing Date: 24 November 1999 (24.11.99) (30) Priority Data: 982556 25 November 1998 (25.11.98) FI (71) Applicant (for all designated States except US): NOKIA NETWORKS OY [FI/FI]; P.O. Box 300, FIN-00045 Nokia Group (FI). (72) Inventor; and (75) Inventor/Applicant (for US only): RAJANIEMI, Jaakko [FI/FI]; Lapinrinne 2 A 11, FIN-00180 Helsinki (FI). (74) Agent: BERGGREN OY AB; P.O. Box 16, FIN-00101 Helsinki (FI).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i> (88) Date of publication of the international search report: 12 October 2000 (12.10.00)

(54) Title: LOCATION MANAGEMENT METHOD**(57) Abstract**

The invention is directed to a method for location management in cellular telecommunication systems. In the inventive method, priority levels are assigned to the cells of the active set of a macro diversity connection. There can be two or more different priority levels. A two-level priority scheme can be realised by further classifying the cells in the active set as being in a serving cell set or outside of the serving cell set. The serving cell set comprises cells, which are in the active set and which are under control of the serving RNC. One of the cells of the serving cell set is selected to be a master cell, which defines the location of the mobile station. More than two priority levels can also be used.

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00969

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: H04Q 7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9608119 A2 (TELIA AB), 14 March 1996 (14.03.96), page 3, line 10 - page 5, line 24 --	1-24
A	WO 9825427 A1 (NOKIA TELECOMMUNICATIONS OY), 11 June 1998 (11.06.98), page 1, line 30 - page 3, line 33 --	1-24
P,A	WO 9931819 A1 (TELEFONAKTIEBOLAGET LM ERICSSON), 24 June 1999 (24.06.99), abstract -----	1-24

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Date of the actual completion of the international search

27 April 2000

Date of mailing of the international search report

07. 06. 2000

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INTERNATIONAL SEARCH REPORT
Information on patent family members

02/12/99

International application No.

PCT/FI 99/00969

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9608119 A2	14/03/96	EP 0777951 A SE 505006 C SE 9402886 A	11/06/97 09/06/97 01/03/96
WO 9825427 A1	11/06/98	AU 5190398 A EP 0945038 A FI 964855 A NO 992693 A	29/06/98 29/09/99 05/06/98 03/06/99
WO 9931819 A1	24/06/99	AU 1795599 A	05/07/99